

Super Lightweight, Metal Rubber Fabric for Extreme Space Environments, Phase I

Completed Technology Project (2006 - 2006)



Project Introduction

NanoSonic has fabricated revolutionary nanostructured, yet macroscale, multifunctional Metal Rubber

TM

films via layer-by-layer, molecular self-assembly, which enables thickness and placement control over multiple constituents for true nanostructured multifunctionality and homogeneity (surface roughness +/- 5 nm). NanoSonic has recently transitioned this innovative approach into a method to produce flexible, super lightweight, conductive fabrics for inflatable spacecraft. In support of NASA's Vision for Space Exploration, low cost Metal Rubber Fabric

TM

would be optimized as high performance textiles and sensors for the Exploration Systems Mission Directorate. Specifically, nanostructured fabrics with ultra-low mass density (0.0011 g/cc), offer electromagnetic interference (EMI) shielding and the elastomeric variants exhibit a novel approach to large area sensors. Metal Rubber Fabric

TM

is not fabricated from conducting polymers or sputter coated fibers. NanoSonic's in situ approach involves chemically reacting monolayers of nanosized components, eliminating residual stress between each constituent. Metal Rubber

TM

technology has led to advanced electrically conductive (as low as $10^{-5} \Omega \cdot \text{cm}$) inorganic/organic hybrid nanocomposites that can be strained to > 1000% elongation that return to the original shape and nominal conductivity when released, even at cryogenic temperatures (-80°C). Metal Rubber Fabric

TM

requires less than 1 vol% of metal, allowing the manufacturing a cost effective, advanced textiles.



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Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Center / Facility:

Langley Research Center (LaRC)

Responsible Program:

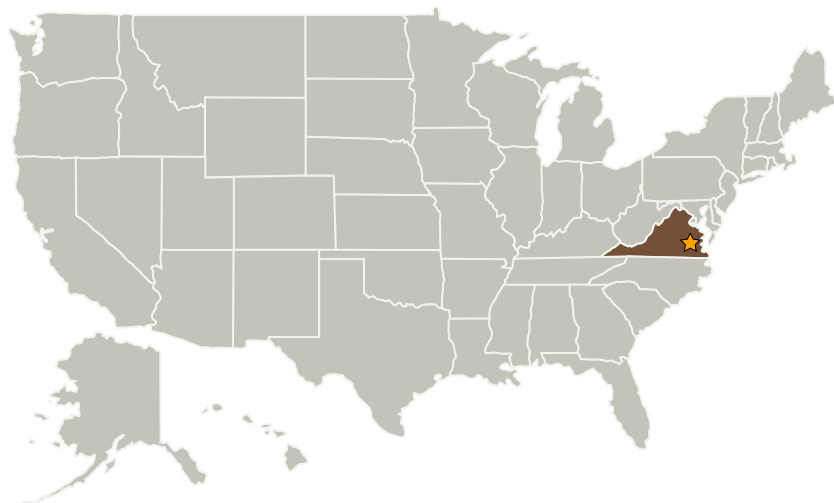
Small Business Innovation Research/Small Business Tech Transfer

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Primary U.S. Work Locations and Key Partners



Organizations Performing Work	Role	Type	Location
★ Langley Research Center (LaRC)	Lead Organization	NASA Center	Hampton, Virginia
Nanosonic, Inc.	Supporting Organization	Industry	Pembroke, Virginia

Primary U.S. Work Locations

Virginia

Project Management

Program Director:

Jason L Kessler

Program Manager:

Carlos Torrez

Technology Areas

Primary:

- TX12 Materials, Structures, Mechanical Systems, and Manufacturing
 - └ TX12.1 Materials
 - └ TX12.1.3 Flexible Material Systems